The PARKING TERRACE

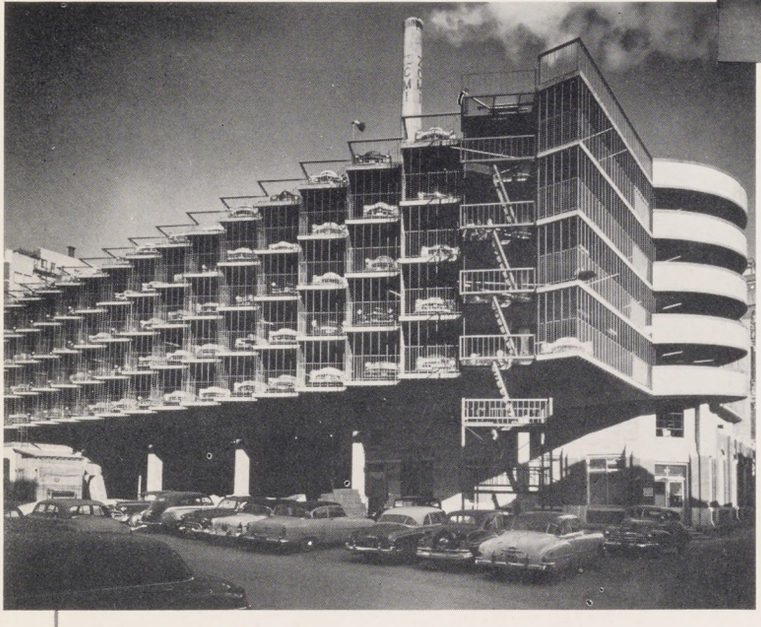
Editorially Acclaimed.....

The parking terrace

MULTI-LEVEL PARKING

at the lowest cost per parking stall

BOWEN, RULE AND BOWEN have created an entirely new concept of the multi-level parking unit with the architectural and engineering design of The Parking Terrace.



Interior and exterior walls may be eliminated where advisable. The split-level design shortens runways and ramps. Ingress and egress can be provided directly from the street without lengthy approaches. Lower ceilings make it possible to have more levels in any given over-all height.

All of this adds up to more actual parking space in relationship to total area. In terms of dollars per parking stall, The Parking Terrace offers the lowest cost of all types of multi-level parking facilities.

BOWEN, RULE AND BOWEN

Original Designers and Developers of The Parking Terrace

2835 GILROY STREET · LOS ANGELES 39, CALIFORNIA

Phone NOrmandy 2-3157

Reprinted from Engineering News Record, December 9, 1954

MID-BLOCK LOCATION forces unusual construction procedures in order to provide least interference for service traffic.

Wall-less Garage Built From Top Down

Precast, prestressed concrete columns resist seismic and vertical loads in Salt Lake City structure

There were unusual site requirements that complicated design and construction of a 542-car parking garage now nearing completion for the ZCMI department store in Salt Lake City: The garage is located in the center of one of Salt Lake's huge downtown city blocks—an area that had to be kept usable during and after construction for truck access to the store; part of the area was occupied by vital service buildings that also had to remain in operation.

As a result, normal procedures were modified to include:

- Precast concrete columns, 52 ft long, that were prestressed in order to reduce weight and to resist horizontal forces.
- A slab casting sequence that started at the top floor, after which the steel and timber forms were winched down for positioning on the four remaining floors.

The columns were designed to span the 20 ft from ground level to the first floor with no walls. The upper floors are also without walls, since the columns are strong enough to resist horizontal forces, and in addition, the needs of a parking building do not necessarily include walls.

• **Big one**—The garage is said to be the largest parking garage in the U. S. that permits customers to park their own cars.

A two-lane approach ramp takes parkers directly to first-floor level, which because of need for continued truck access to the store, is 20 ft above ground level. Floors are 8 ft apart, each floor divided longitudinally with the east half being 4 ft higher than the west half to permit use of ramps from half-level to half-level.

The up-ramp group circles the southern $\frac{3}{5}$ths of the building and the down-ramp group the northern $\frac{2}{5}$ths. Traffic flow is arranged in a counter-clockwise pattern to minimize interference and confusion.

Customers can walk from their cars directly to the ZCMI (Zion's Cooperative Mercantile Institute) store from three of the five garage levels, since there are two floors in the garage for each floor in the store. Thus, the first, third and fifth garage levels correspond with the second, third and fourth floors in the store.

Elevator service is available in the store or by a new elevator system that is being constructed in connection with the garage.

The entrance ramp is panel-heated against icing. Ramps between adjacent floors in the garage are covered with an asphalt-impregnated burlap surfacing for better skid resistance.

• **Precast, prestressed columns**—The 115x300-ft building is supported by a total of 40 precast columns, most of which are 52 ft high.

Primary reason for prestressing the columns was to increase the strength-weight ratio and thus reduce the problems involved in transporting and placing the columns. But the columns had to have greater than normal strength since they are the only seismic resisting elements in the building.

The top 32 ft of the columns is 4 ft wide and 10 in. thick and includes 10 prestressing cable assemblies having 7 wires of 0.25-in. dia each.

The bottom 20 ft of the columns—up to first floor level—is heavier, due to the greater unsupported length. This portion is 4 ft wide by 18 in. thick and includes an additional 10 prestressing cables.

All prestressing tendons are anchored with pressed-on heads in a one-inch-thick base plate that is recessed to receive the button heads of the wires. All tendons were pulled from the upper end after the 5,000-psi concrete reached full strength.

At each floor level there is a pro-

(continued on page five)

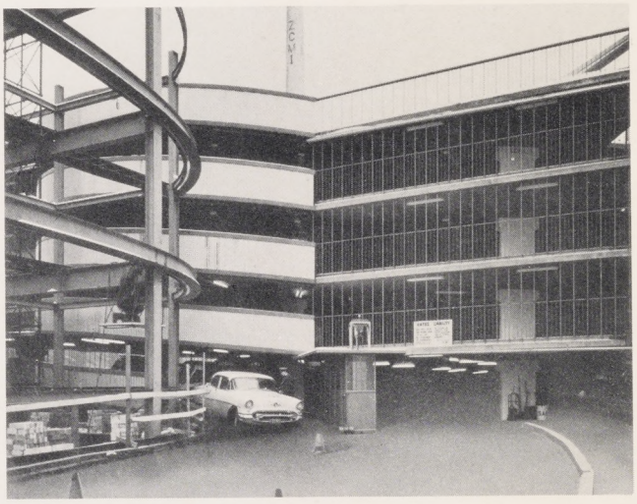
The parking terrace

CONSULTATION...

Architectural and Engineering Design . . . Complete Construction Service . . . anywhere in America

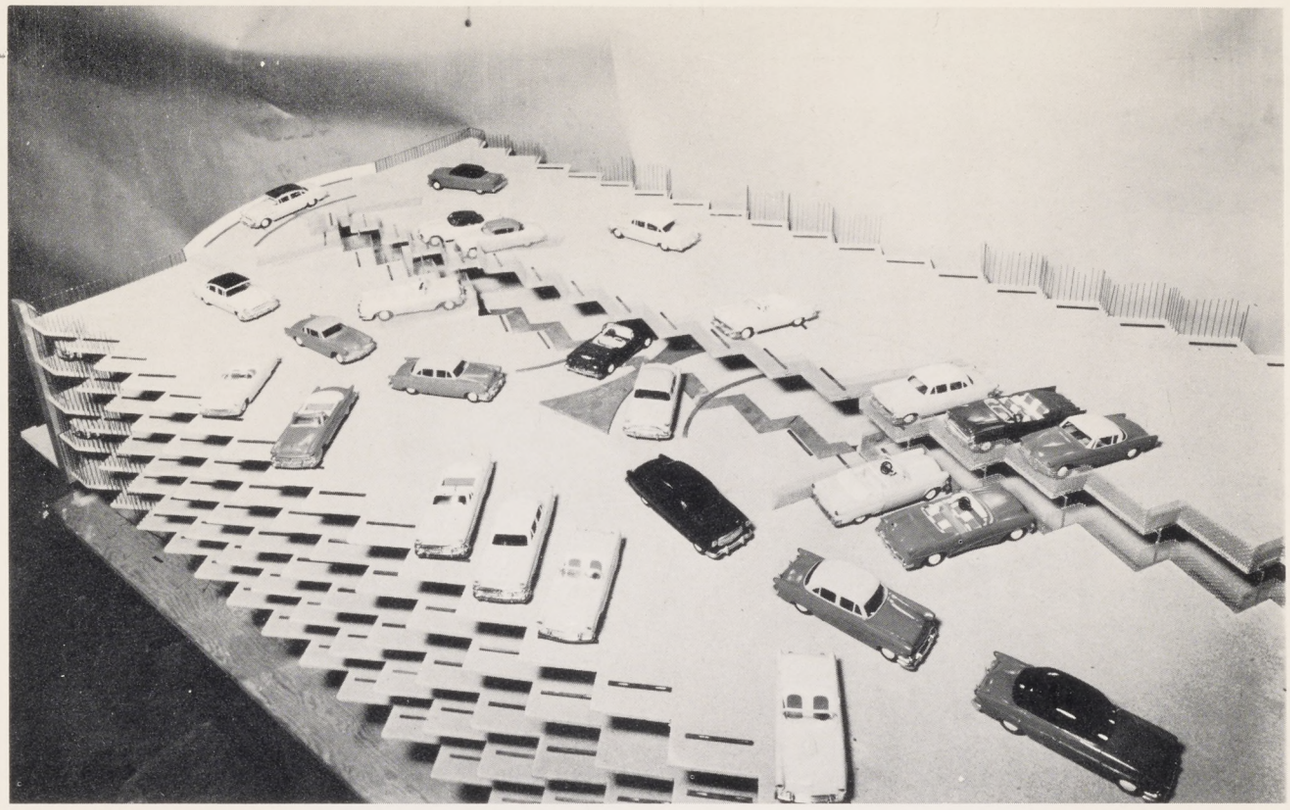
When the first Parking Terrace was built for ZCMI, Salt Lake City, Utah, scores of top executives representing large commercial establishments, hotels, and industrial concerns, as well as property owners and municipal officials came from all parts of the country to inspect this significant new advancement in parking facility design.

They saw fireproof parking decks constructed for $2.88 a square foot. They saw a self-parking garage that had been erected at a cost of $900.00 per parking stall. They saw the operation of multi-level parking facility that provided exit in 45 seconds or less from any stall in the 5-level structure.



In addition to the article reprinted herewith from Engineering-News Record—the Architectural Forum, Southwest Builder and Contractor, other national magazines and metropolitan newspapers gave full scale coverage to The Parking Terrace. The Architectural League of New York invited the entry of The Parking Terrace in the national Gold Medal Exhibition of 1955, in which Bowen, Rule and Bowen were awarded honorable mention in engineering.

In answer to the nation-wide interest in this engineering achievement, Bowen, Rule and Bowen are now offering a complete service available throughout America, which embodies consultation planning, architectural and engineering design, and construction service for the creation of The Parking Terrace. Whenever advisable, the Youtz-Slick Lift Slab construction method is utilized for added economy and efficiency. Consult your local Lift-Slab licensee for preliminary plans and estimates.



SELF-PARKING made easy. Floors are split longitudinally with sets of connecting ramps to separate incoming and outgoing traffic.

(continued from page three)

jection to provide additional slab support. The slab reinforcing-bar pattern is continuous through the columns. Dowels were cast into the columns and later welded to the floor-slab steel.

Eleven of the 40 columns had to be placed through holes in the roofs of existing buildings, on previously cast footings. The underlying material is an almost perfectly graded alluvial rock that was considered good for 6,500 psi dead load and for 10,000 psi dead plus live load including earthquake load.

Some of the footings in the existing buildings had to be substantially above ground level. The footings were designed so that, together with the superimposed columns, the same stiffness would result as for an ordinary column-footing assembly. Uniform stiffness is important in assuring that the columns are subject to equal lateral load—usually assumed to be distributed in proportion to relative rigidity of vertical resisting elements.

The columns were trucked the 17 blocks from the contractor's casting yard to the job site, on low-bed trailers with special police escort.

Two 20-ton cranes working through a spreader beam were used to lift and position the 15-ton columns at the job site. A steel plate cast in the top of the column made provision for a two-point lift.

As soon as the columns were in place they were braced with timber and steel-rod frames. These frames aided in plumbing the columns (although the workmanship was so good that the most any one column was out of plumb was 1¼-in.). They also served to assure stability of the building during the casting of the upper two floors.

• **Forms move down**—Floor slab casting started at 5th floor level. Slabs were cast in four-column bays with the panels about 55 ft square. Adjacent panels were separated by an opening of about 3 ft that was concreted after form stripping.

Concrete was pumped into place, mixing being done at ground level. After the concrete had reached adequate strength, the forms were winched down to the next floor level. Eight manually operated winches—two on each column—lowered the forms. Pull on each winch was about 75 lb. Total time to lower a floor panel and position it for the subsequent pour

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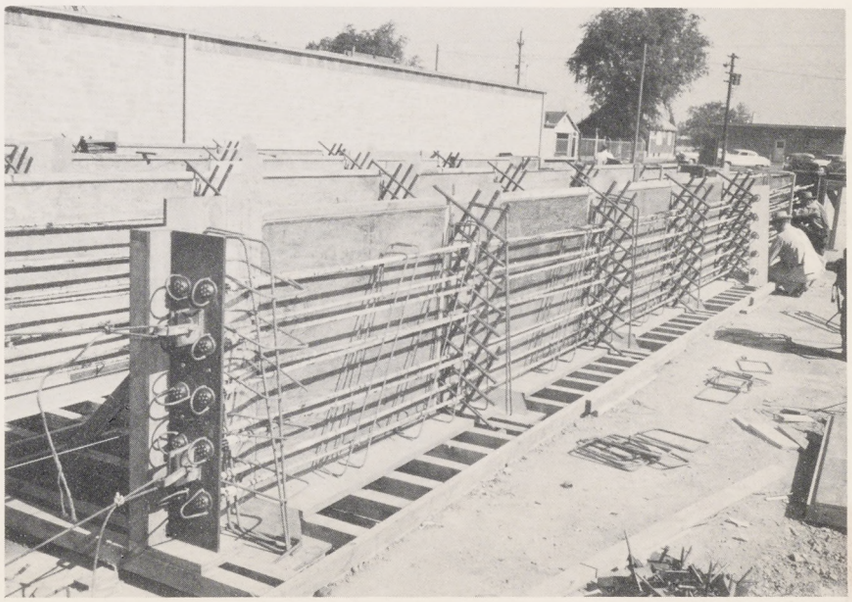
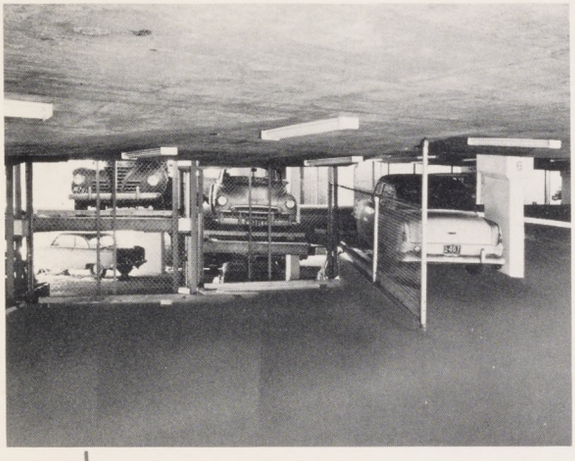


PRESTRESSED COLUMNS are 52 ft long, include 10 prestressing cables for full height and 10 more up to first floor level.

The parking terrace

ADAPTABLE TO ANY SITE...

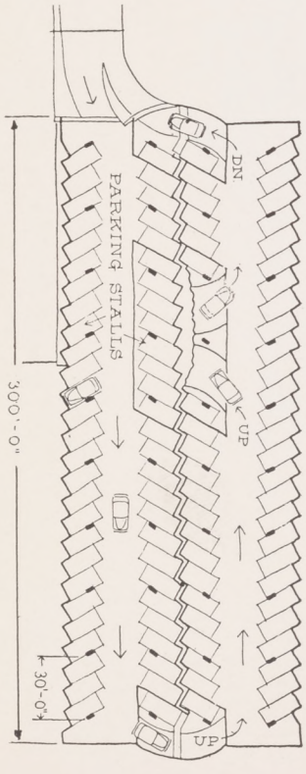


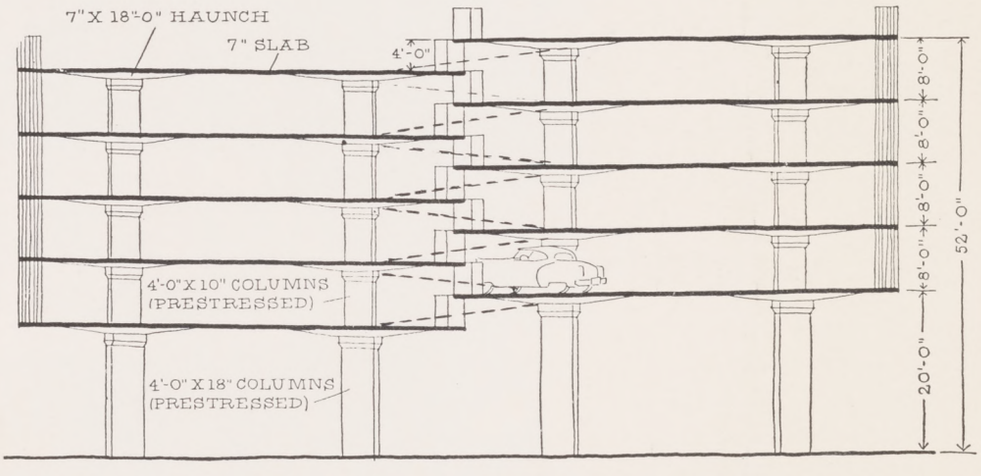
The basic engineering principles in The Parking Terrace can be effectively adapted to any ground area — of sufficient size ... on a corner or in the middle of the block. The Parking Terrace can be constructed with elevators to exclusively serve an adjacent building ...

... it can be successfully operated independently ... at a profit

... it can become an integral part of a department store or other buildings

... it can be operated either completely self-service or with parking attendants





Transverse section through garage shows staggered parking levels

GREATER PARKING CONVENIENCE...

Even when operated as a self-service unit, The Parking Terrace provides the fastest and safest parking yet devised. At the ZCMI unit in Salt Lake City, cars can roll out into the street at intervals of 12 seconds between cars. Congestion is virtually impossible within the structure. In-and-out traffic flows smoothly without interference.

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was about ½ hour. Following this procedure the contractor was able to pour an average of nearly two panels a day.

• **Slab design**—Slab design was made complex because the columns were positioned at 60-deg angles to minimize interference with the parking pattern. Slab thickness is 7 in., but included is a tapered haunch 18 ft square. Thickness increases to 14 in. for a 5-ft square around the columns.

A model analysis made by Presan Corp. of Los Angeles aided slab design. In addition to the complications developed by the column orientation and the heavy haunch, the design had to consider the floor for both construction and finished conditions: During construction there were extensive cantilever elements, but after gaps between form panels were closed, the slab became continuous. The model analysis facilitated this design, and gave the qualitative effect of the 5% seismic load.

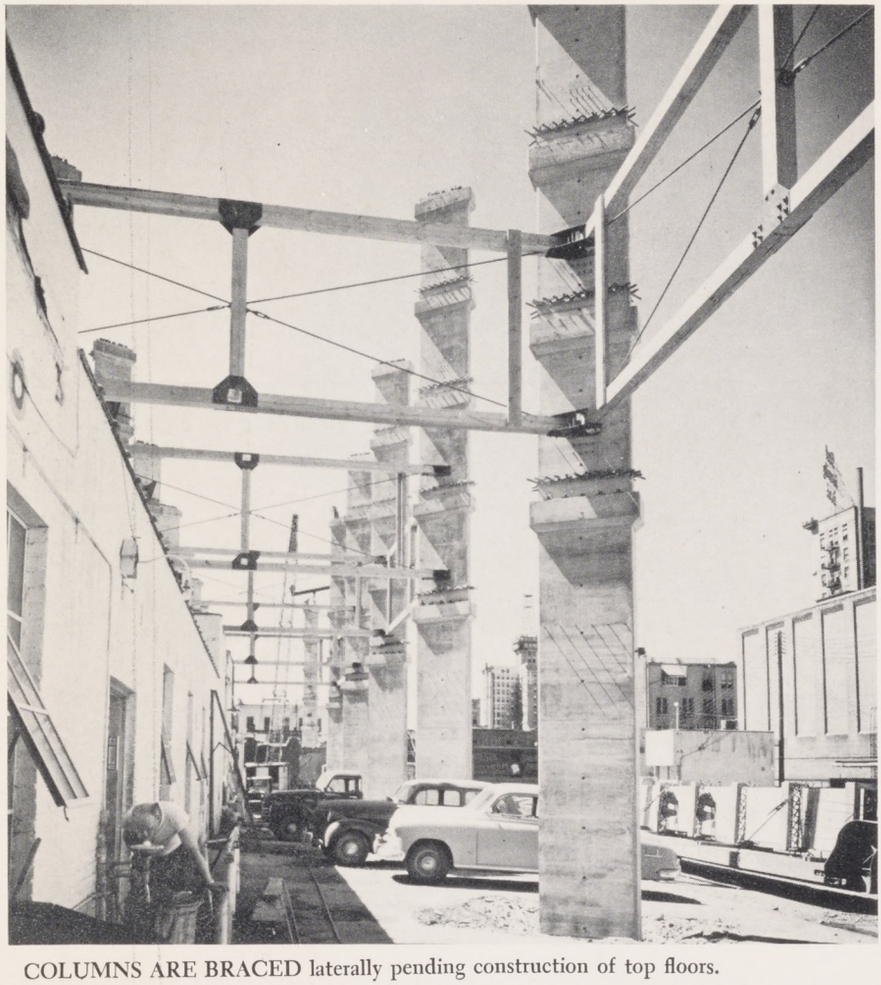
Another application of the model analysis was in slab form design.

The forms were designed as carefully as the building to minimize deflection during construction operations. Included in design considerations was the elastic deformation of the slab plus the plastic deformation of the concrete and the deflection of the forms under the weight of the wet concrete. Elastic deformation of the slab came from the model analysis.

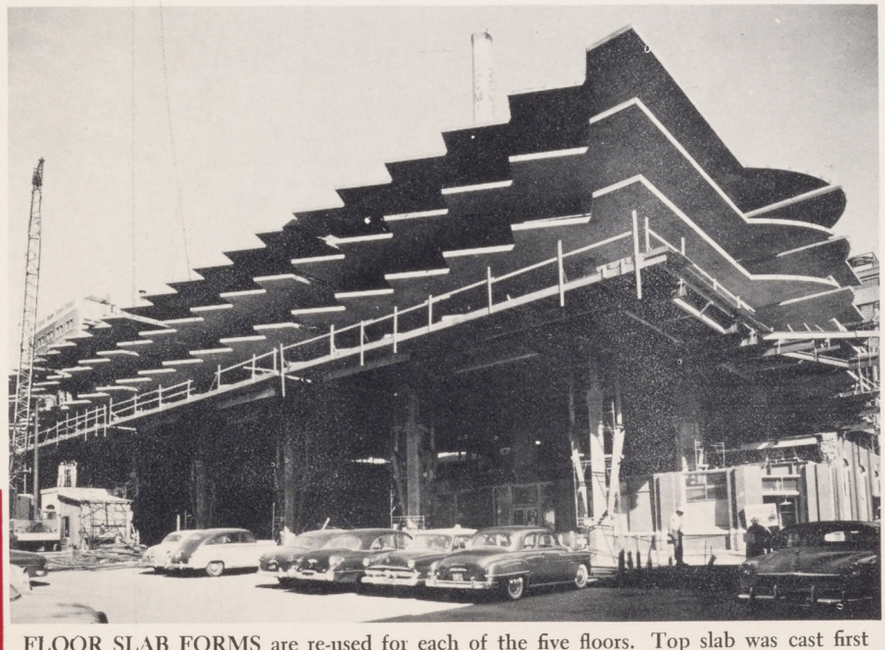
Each form panel is supported by four 18-in., 50-lb wide-flange beams in the east-west direction. Across these are five 15-in., 42.9-lb I-beams in the north-south direction. And there are additional steel or wood cross beams supporting the 2x10 joists at 2-ft centers. The forms are faced with ¾-in. plywood sheathing. The plywood was coated with a plastic paint before the first use and thoroughly cleaned without recoating after each subsequent use.

The slab concrete has 4,000 psi strength and includes an air-entraining admixture. Purpose of the air entrainment is to resist spalling due to use of salts on Salt Lake City streets during winter ice conditions.

The $1-million building was designed for the department store by Bowen, Rule & Bowen, consulting engineers of Los Angeles. Contractor on the work is Jacobson Construction Co. of Salt Lake City.



COLUMNS ARE BRACED laterally pending construction of top floors.



FLOOR SLAB FORMS are re-used for each of the five floors. Top slab was cast first and forms winched down to next position.

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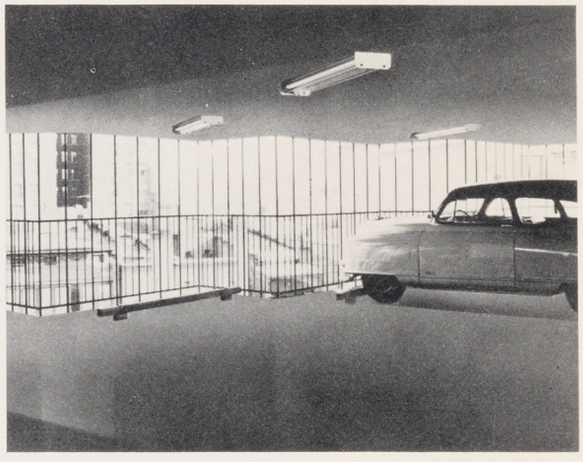
The parking terrace

LOWEST OPERATING COST...

When desired, The Parking Terrace, accommodating hundreds of cars, can be operated with only two attendants — plus one emergency man servicing all the floors. Numbered tickets with corresponding numbers painted in the parking slot make self-service automatic and convenient. From the standpoint of maintenance, The Parking Terrace is far superior — 100% concrete construction eliminates all ordinary upkeep expense. Except when elevators are installed for service to an adjacent building, no machinery nor moving parts are used in the Parking Terrace. The only thing that *moves* is the traffic.



HIGHEST INCOME PER DOLLAR INVESTED

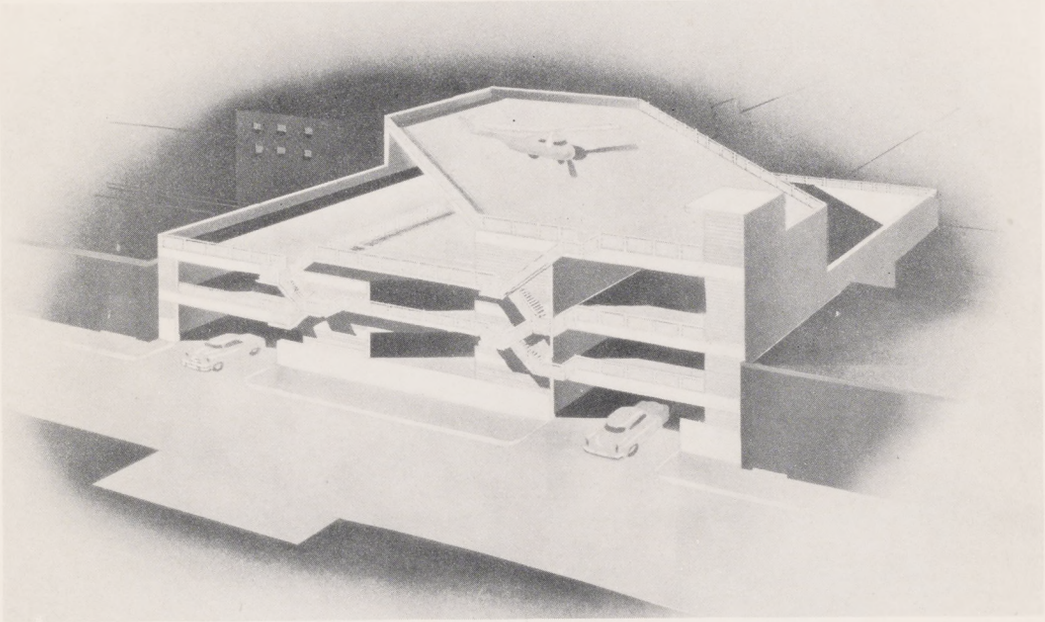
One basic factor only determines the profit potential of a parking facility, regardless of type. This is land cost, construction cost and operating payroll divided by the number of parking stalls provided.

Multi-level parking obviously multiplies the number of parking stalls on a given ground area. The Parking Terrace, with split-levels, short ramps and approaches, and low ceilings, affords the maximum number of parking stalls per cubic foot of structure and investment dollar.

The parking terrace

WITH HELIPORT

FOR THE CITY OF GLENDALE, CALIFORNIA



An outstanding example of the adaptability of The Parking Terrace to special needs is shown in this newly developed design which incorporates a heliport landing space atop a split-level Parking Terrace.

The Heliport is designed to provide passenger service to the Los Angeles International Airport, a base for helicopter mail service and a port of landing for the regular helicopter passenger line service now operating between the large Southern California communities.

This Parking Terrace contains 251 parking stalls with an average of 326 square feet. The total area of the parking facility is 81,745 square feet. The estimated cost of the heliport is $40,000, $12,000 for elevator, with Parking Terrace itself costing $259,000 or a total of $311,000.

Facilities such as this, combination parking unit and heliport, are needed in many metropolitan centers to provide additional parking space in built-up areas . . . and furnish quick commuters service to major airports.

The professional services offered by BOWEN, RULE and BOWEN

Our staff is composed of engineers covering every phase of the construction planning field; site planning, architectural, structural, electrical, and mechanical engineering . . . construction supervision and inspection, estimates, appraisals, investigations and reports, laboratory testing, research and model analysis.

The multiplicity of services required to efficiently carry through the erection of a Parking Terrace from preliminary planning to final inspection, is readily understood. Bowen, Rule and Bowen utilize the experience gained in 30 years of engineering leadership to correlate these varied and exacting activities under one sound management. Duplication of administrative expense is eliminated, overlapping services are avoided, and projects are expedited with a maximum of efficiency.

In addition, Bowen, Rule and Bowen will handle the entire contract for a complete Parking Terrace using a general construction contractor acceptable to the client. This further eliminates duplicated effort and expense, and results in a substantial saving on the completed job.

LEE WARBURTON
President

PARKING TERRACES, INC.
222 So. Beverly Dr. • Beverly Hills, Calif. • CRestview 5-5249

AIRE — THE PARKING TERRACE

e our engineering staff with the necessary information to prepare a preliminary plan and estimate of The Parking Terrace which will meet your individual requirements.

How many cars do you wish to park? _____

What are the dimensions of your lot? North Side _____ East Side _____

South Side _____ West Side _____

Between what two sides is there a right angle? _____ _____

What sides are property lines? _____ North _____ East _____

South _____ West _____

What sides are public streets? _____ North _____ East _____

South _____ West _____

What streets are one-way traffic? _____

Which way does the traffic go? _____ North _____ East _____

South _____ West _____

Which way does the property slope? From _____ To _____

How many feet vertically does the lot slope? _____

Do you wish entrance from parking floors to adjoining building? _____

_____ Which ones? _____

Do you have a building ordinance and if so, which one? _____

Do you want a passenger elevator or escalator constructed in connection with your parking facility? _____

Is it your idea to have customer parking or attendant parking? _____

Are you interested in an analysis of the operating cost of the parking facility? _____

Name of Firm: _____

Address: _____

_____

City Zone State Telephone

_____

Official's Name

_____

Title

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Mail to:

Bowen, Rule and Bowen
2835 Gilroy Street
Los Angeles 39, California

QUESTIONNAIRE — THE PARKING TERRACE

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...ENGINEERING CONSULTATION WITHOUT CHARGE...

We will be glad to have our engineering representative consult with you and submit preliminary plans, costs, and operational survey. There is no charge for this service for those who are seriously contemplating the construction of a parking facility.

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